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TOWNSEND AND TOWNSEND AND CREW, LLP
TWO EMBARCADERO CENTER
EIGHTH FLOOR
SAN FRANCISCO, CA 94111-3834

EXAMINER	
COUGHLAN, PETER D	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary for Applications Under Accelerated Examination	Application No. 10/825,032	Applicant(s) HAUDRICH ET AL.
	Examiner Peter Coughlan	Art Unit 2129

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Since this application has been granted special status under the accelerated examination program,

NO extensions of time under 37 CFR 1.136(a) will be permitted and a SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE:

ONE MONTH OR THIRTY (30) DAYS, WHICHEVER IS LONGER,
FROM THE MAILING DATE OF THIS COMMUNICATION – if this is a non-final action or a *Quayle* action.
(Examiner: For **FINAL** actions, please use PTOL-326.)

The objective of the accelerated examination program is to complete the examination of an application within twelve months from the filing date of the application. Any reply must be filed electronically via EFS-Web so that the papers will be expeditiously processed and considered. If the reply is not filed electronically via EFS-Web, the final disposition of the application may occur later than twelve months from the filing of the application.

Status

1)☒ Responsive to communication(s) filed on *20 July 2006*.
2)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

3)☒ Claim(s) *1-30* is/are pending in the application.
3a) Of the above claim(s) _____ is/are withdrawn from consideration.
4)☐ Claim(s) _____ is/are allowed.
5)☒ Claim(s) *1-30* is/are rejected.
6)☐ Claim(s) _____ is/are objected to.
7)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

8)☐ The specification is objected to by the Examiner.
9)☒ The drawing(s) filed on *14 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
10)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

11)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a)☐ All b)☐ Some * c)☐ None of:
1.☐ Certified copies of the priority documents have been received.
2.☐ Certified copies of the priority documents have been received in Application No. _____.
3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Detailed Action

1. This office action is in response to an AMENDMENT entered July 20, 2006 for the patent application 10/825032 filed on May 3, 2002.

2. The First Office Action of April 14, 2004 is fully incorporated into this Final Office Action by reference.

Status of Claims

3 Claims 1-30 are pending.

Claim Rejections - 35 USC § 112

4. Claims 6 and 16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. These two claims use the phrases ‘bias module’, ‘scalar bias value’, ‘maximum weight’ which are not described in the specification. Applicant claims that these terms are in ¶0044 and ¶0057, but the Examiner could not find these terms anywhere in the specification.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 14, 15 are rejected under 35 U.S.C. 102(b) (hereinafter referred to as **Spencer**) being anticipated by Spencer, 'Adaptive nonlinear neural network controller for rotorcraft vibration.'

Claim 14

Spencer teaches an input module configured to receive a weight and a location of the weight on a structure (**Spencer,** p539:8-18 and 35-41); and a neural network module coupled to the input module and configured to provide the weight and location as inputs to a trained neural network having at least two neurons to determine a flutter speed and an associated flutter frequency based in part on the weight and location. (**Spencer,** p538:14 through p539:28, p545:13-24; 'Flutter speed' and 'flutter frequency' of applicant is equivalent to 'rotational speed (Ω)' and dominant frequency (NΩ).)

Claim 15

Spencer teaches the location of the weight is selected from a predetermined number of locations on a structural model. (**Spencer,** p539: 35-41; The 'number of locations' of applicant is equivalent to 'location of each fictitious joint' of Spencer.)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 5, 21, 22, 28, 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Spencer as set forth above, in view of NMAB-497. ('Small Business Innovation Research to Support Aging Aircraft', referred to as **NMAB-497**)

Claim 1

Spencer does not teach an input module configured to receive one or more input parameters associated with aeroelastic characteristics of a structure, the one or more input parameters related to a repair of the structure; and a neural network module coupled to the input module, and configured to generate a transformation of the one or more input parameters to produce at least one aeroelastic analysis result, the transformation based in part on a trained neural network.

NMAB-497 teaches an input module configured to receive one or more input parameters associated with aeroelastic characteristics of a structure, the one or more input parameters related to a repair of the structure (**NMAB-497,** p39:3-20, p41:3-14, p42:31-32; 'Input parameters' of applicant is illustrated by 'neural networks' having inputs. 'Parameters related to a repair of a structure' of applicant is equivalent to 'evaluation guidelines for the lives of bolted repairs' of NMAB—497.); and a neural network module coupled to the input module, and configured to generate a transformation of the one or more input parameters to produce at least one aeroelastic analysis result, the transformation based in part on a trained neural network. (**NMAB-497,** p37 and p39:3-20, Titlepage; 'Aeroelastic analysis' of applicant is equivalent to 'nondestructive evaluation methods' of NMAB-497. Aeroelastic characteristics of applicant is demonstrated by 'aging aircraft' of NMAB-497 which is subject to aeroelastic properties.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Spencer by having aeroelastic characteristics going into a neural network for analyzing purposes as taught by NMAB-497 to have an input module configured to receive one or more input parameters associated with aeroelastic characteristics of a structure, the one or more input parameters related to a repair of the structure; and a neural network module coupled to the input module, and configured to generate a transformation of the one or more input parameters to produce at least one aeroelastic analysis result, the transformation based in part on a trained neural network.

For the purpose of using non-destructive analyzing methods of a structure.

Claim 2

Spencer teaches an output module coupled to the neural network module (**Spencer,** p543:14 through p544:5; 'Output module' of applicant is equivalent to 'two output channels' of Spencer.), and configured to output the at least one aeroelastic analysis result. (**Spencer,** p543:14 through p544:5; ' Aeroelastic analysis result' of applicant is equivalent to 'control the beam of Spencer.)

Claim 5

Spencer teaches the one or more input parameters comprise: a weight (**Spencer,** abstract; 'Weight' of applicant is equivalent to 'mass' of Spencer.); and a location of the weight on the structure. (**Spencer,** p539:35-41)

Claim 21

Spencer does not teach receiving at least one input parameter related to a repair an aircraft structure.

NMAB-497 teaches receiving at least one input parameter related to a repair an aircraft structure. (**NMAB-497,** p39:3-20, p41:3-14, p42:31-32, Title page; 'Input parameters' of applicant is illustrated by 'neural networks' having inputs. 'Parameters related to a repair of a structure' of applicant is equivalent to 'evaluation guidelines for the lives of bolted repairs' of NMAB—497. 'Structure' of applicant is equivalent to 'aircraft' of MNAB-497.) It would have been obvious to a person having ordinary skill in

the art at the time of applicant's invention to modify the teachings of Spencer by using data from a repair for analysis as taught by NMAB-497 to have at least one input parameter related to a repair an aircraft structure.

For the purpose of analyzing the result of the repair.

Spencer teaches applying a predetermined neural network transfer function to the at least one input parameter to generate an aeroelastic analysis result (**Spencer,** abstract; 'Vibrations' would be the input and the output of the aeroelastic analysis would be for the 'structure actuators'); and outputting the result.(**Spencer,** abstract; The outputted results control the structure actuators.)

Claim 22

Spencer teaches and receiving a weight (**Spencer,** abstract); and receiving location of the weight on the aircraft structure. (**Spencer,** p539: 35-41).

Claim 28

Spencer does not teach receiving at least one input parameter related to a repair of an aircraft structure.

NMAB-497 teaches receiving at least one input parameter related to a repair of an aircraft structure. (**NMAB-497,** p39:3-20, p41:3-14, p42:31-32, Title page; 'Input parameters' of applicant is illustrated by 'neural networks' having inputs. 'Parameters related to a repair of a structure' of applicant is equivalent to 'evaluation guidelines for the lives of bolted repairs' of NMAB—497. 'Structure' of applicant is equivalent to

'aircraft' of MNAB-497.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Spencer by using repaired information as taught by NMAB-497 to have at least one input parameter related to a repair of an aircraft structure.

For the purpose of being able to analyze repaired structures within the aircraft.

Spencer teaches applying a predetermined neural network transfer function to the at least one input parameter to generate an aeroelastic analysis result (**Spencer,** abstract; 'Vibrations' would be the input and the output of the aeroelastic analysis would be for the 'structure actuators')t; and outputting the result. (**Spencer,** abstract; The outputted results control the structure actuators.)

Claim 30

Spencer does not teach means for receiving input parameters relating to a repair of an aircraft structure.

NMAB-497 teaches means for receiving input parameters relating to a repair of an aircraft structure. (**NMAB-497,** p39:3-20, p41:3-14, p42:31-32, Title page; 'Input parameters' of applicant is illustrated by 'neural networks' having inputs. 'Parameters related to a repair of a structure' of applicant is equivalent to 'evaluation guidelines for the lives of bolted repairs' of NMAB—497. 'Structure' of applicant is equivalent to 'aircraft' of MNAB-497.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Spencer by using

repair information as taught by NMAB-497 to have the means for receiving input parameters relating to a repair of an aircraft structure.

For the purpose of being able to analyze repaired structures within the aircraft.

Spencer teaches means for applying a neural network transfer function to the input parameters to generate an aeroelastic analysis result; (**Spencer,** Input parameters would be mass and stiffness.) and means for outputting the result. (**Spencer,** abstract; The outputted results control the structure actuators.)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 3, 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Spencer and NMAB-497 as set forth above, in view of Eberhart. (U. S. Patent Publication 20030191406, referred to as **Eberhart**)

Claim 3

Spencer and NMAB-497 do not teach the input module comprises at least one input/output (I/O) device selected from the group comprising a keyboard, a keypad, a computer mouse, a trackball, a button, a switch, a slides, a knobs, and a dial.

Eberhart teaches the input module comprises at least one input/output (I/O) device selected from the group comprising a keyboard, a keypad, a computer mouse, a trackball, a button, a switch, a slides, a knobs, and a dial. (**Eberhart,** ¶0102) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Spencer and NMAB-497 by using standard input and output devices as taught by Eberhart to have the input module comprises at least one input/output (I/O) device selected from the group comprising a keyboard, a keypad, a computer mouse, a trackball, a button, a switch, a slides, a knobs, and a dial.

For the purpose of using industrial standard input and output devices.

Claim 4

Spencer and NMAB-497 do not teach the input module comprises at least one input/output (I/O) device selected from the group comprising an electronic port, an electrical connector, a receiver, a wireless receiver, an optical reader, an optical detector, a magnetic reader, and a magnetic detector.

Eberhart teaches the input module comprises at least one input/output (I/O) device selected from the group comprising an electronic port, an electrical connector, a receiver, a wireless receiver, an optical reader, an optical detector, a magnetic reader,

and a magnetic detector. (**Eberhart,** 0045) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Spencer and NMAB-497 by various input devices as taught by Eberhart to have the input module comprises at least one input/output (I/O) device selected from the group comprising an electronic port, an electrical connector, a receiver, a wireless receiver, an optical reader, an optical detector, a magnetic reader, and a magnetic detector.

For the purpose of using non-invasive measuring devices that can be used with the non-invasive neural network.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 6-10, 13, 16-20, 23, 25, 27, 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Spencer and NMAB-497 as set forth above,

in view of Natarajan. ('Aeroelasticity of Morphing Wings Using Neural Networks, referred to as **Natarajan**)

Claim 6

Spencer teaches wherein the neural network module comprises: a weight vector module configured to multiply the one or more input parameters by a weighting vector to generate one or more weighted parameters. (**Spencer,** abstract; Stiffness and mass are two input parameters.)

Spencer and NMAB-497 do not teach a bias module configured to provide a scalar bias value; a summer coupled to the weight vector module and the bias module and configured to output a sum of the one or more weighted parameters and the bias value; and a transfer function module coupled to the summer and configured to apply a transfer function to the sum.

Natarajan teaches a bias module configured to provide a scalar bias value (**Natarajan,** p54, Figure 3.1, 'b' and 'c' are neutron bias modules.); a summer coupled to the weight vector module and the bias module and configured to output a sum of the one or more weighted parameters and the bias value (**Natarajan,** p54, Figure 3.1; 'b1', 'b2' and 'b4' all take in multiple weights and input parameters and output multiple weighted results); and a transfer function module coupled to the summer and configured to apply a transfer function to the sum. (**Natarajan,** p53:10 through p54:8; 'Transfer function' of applicant is equivalent to 'f(x)' of Natarajan.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the

combined teachings of Spencer and NMAB-497 by computing the scalar bias value, resulting in outputting weighted parameters as taught by Natarajan to have a bias module configured to provide a scalar bias value; a summer coupled to the weight vector module and the bias module and configured to output a sum of the one or more weighted parameters and the bias value; and a transfer function module coupled to the summer and configured to apply a transfer function to the sum.

For the purpose of highlighting the basic components of a neural network.

Claim 7

Spencer and NMAB-497 do not teach the transfer function comprises a non-linear transfer function.

Natarajan teaches the transfer function comprises a non-linear transfer function. (**Natarajan,** p53:10 through p54:8; 'Non-linear transfer function' of applicant is equivalent to 'Sigmoidal function' of Natarajan.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Spencer and NMAB-497 by limiting the transfer function as taught by Natarajan to have the transfer function comprises a non-linear transfer function.

For the purpose of taking advantage of a neural network property of handling non-linear problems with exceptional results.

Claim 8

Spencer and NMAB-497 do not teach the transfer function comprises a tangent sigmoid function.

Natarajan teaches the transfer function comprises a tangent sigmoid function. (**Natarajan,** p53:10 through p54:8) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Spencer and NMAB-497 by using the sigmoid function as taught by Natarajan to have the transfer function comprises a tangent sigmoid function.

For the purpose of configuring the neurons to implement a hyperbolic tangent sigmoid function.

Claim 9

Spencer and NMAB-497 do not teach the transfer function comprises at least one function selected from the group comprising a sigmoid, a hyperbolic tangent sigmoid, a logarithmic sigmoid, a linear function, a saturated linear function, and a radial basis function.

Natarajan teaches the transfer function comprises at least one function selected from the group comprising a sigmoid, a hyperbolic tangent sigmoid, a logarithmic sigmoid, a linear function, a saturated linear function, and a radial basis function. (**Natarajan,** p53:10 through p54:8) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Spencer and NMAB-497 by having the transfer function being able to have various functions as taught by Natarajan to have the transfer function comprises at least

one function selected from the group comprising a sigmoid, a hyperbolic tangent sigmoid, a logarithmic sigmoid, a linear function, a saturated linear function, and a radial basis function.

For the purpose of using a standard transfer function enables consistence comparison with other neural networks that employ a Sigmoid transfer functions.

Claims 10, 25

Spencer and NMAB-497 do not teach the at least one aeroelastic analysis result comprises a flutter frequency at a damping value.

Nataraja teaches the at least one aeroelastic analysis result comprises a flutter frequency at a damping value. (**Natarajan,** p44 through p48; Natarajan illustrates frequency at a given damping value in Figure 2.14) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Spencer and NMAB-497 by calculating frequency as taught by Natarajan to have at least one aeroelastic analysis result comprises a flutter frequency at a damping value.

For the purpose of determining the minimum flutter frequency using a given damping value.

Claims 13 and 27

Spencer and NMAB-497 do not teach the at least one aeroelastic analysis result comprises a contour plot of store loads.

Natarajan teaches the at least one aeroelastic analysis result comprises a contour plot of store loads. (**Natarajan,** p46, Figures 2.13 and 2.14; 'Store loadings' of applicant is equivalent to a collection of data points of Natarajan.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Spencer and NMAB-497 by generating a contour plot as taught by Natarajan to have at least one aeroelastic analysis result comprises a contour plot of store loads.

For the purpose of of examining all the data from a single source.

Claim 16

Spencer and NMAB-497 do not teach the weight comprises a weight less than a predetermined maximum weight.

Natarajan teaches the weight comprises a weight less than a predetermined maximum weight. (**Natarajan,** p21:13-16; 'Maximum weight' of applicant is equivalent to 'maximum pressure drag', of Natarajan.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Spencer and NMAB-497 by using weight within a given domain as taught by Natarajan to –have the weight comprises a weight less than a predetermined maximum weight.

For the purpose of not using weight values that will never be used.

Claim 17

Spencer does not teach determining input parameters relating to one or more repairs performed on a structure.

NMAB-497 teaches determining input parameters relating to one or more repairs performed on a structure. (**NMAB-497,** p39:3-20, p41:3-14, p42:31-32, Title page; 'Input parameters' of applicant is illustrated by 'neural networks' having inputs. 'Parameters related to a repair of a structure' of applicant is equivalent to 'evaluation guidelines for the lives of bolted repairs' of NMAB—497. 'Structure' of applicant is equivalent to 'aircraft' of MNAB-497.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Spencer by input values relating to a repair as taught by NMAB-497 to determine input parameters relating to one or more repairs performed on a structure.

For the purpose of being able to analyze the repair of the structure.

Spencer and NMAB-497 do not teach determining a training set of characteristic I/O pairs; generating a neural network; training the neural network using the training set to generate a trained neural network; and determining aeroelastic characteristics of a structure based in part on the trained neural network.

Natarajan teaches determining a training set of characteristic I/O pairs (**Natarajan,** p59 through p64; 'Characteristic I/O pairs' of applicant is equivalent to 'resilient back-propagation training routine' of Natarajan.); generating a neural network (**Natarajan,** p56-59); training the neural network using the training set to generate a trained neural network (**Natarajan,** p59 through p64; When convergence is obtained then training is complete.); and determining aeroelastic characteristics of a structure

based in part on the trained neural network. (**Natarajan,** abstract) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Spencer and NMAB-497 by using the non-invasive techniques for analyzing aeroelastic characteristics as taught by Natarajan to determine a training set of characteristic I/O pairs; generating a neural network; training the neural network using the training set to generate a trained neural network; and determining aeroelastic characteristics of a structure based in part on the trained neural network.

For the purpose of having accurate results from the neural network due to training.

Claim 18

Spencer and NMAB-497 do not teach determining an accuracy of the aeroelastic characteristics determined using the trained neural network.

Natarajan teaches determining an accuracy of the aeroelastic characteristics determined using the trained neural network. (**Natarajan,** p60:16 through p61:5) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Spencer and NMAB-497 by using a neural network as taught by Natarajan to determine the accuracy of the aeroelastic characteristics determined using the trained neural network.

For the purpose of using non-destructive analyzing methods.

Claim 19

Spencer and NMAB-497 do not teach determining a weight vector in the trained neural network, and determining a bias value in the trained neural network.

Natarajan teaches determining a weight vector in the trained neural network. (**Natarajan,** p53:9 and p55:2-4) ; and determining a bias value in the trained neural network. (**Natarajan,** p79:13-17) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Spencer and NMAB-497 by generating a bias value as taught by Natarajan to determine a weight vector in the trained neural network, and determining a bias value in the trained neural network.

For the purpose of summing with input parameters for the neural network.

Claim 20

Spencer and NMAB-497 do not teach determining the aeroelastic characteristics comprises: multiplying received input parameters by the weight vector to generate weighted parameters; summing the weighted parameters and the bias value to generate a summed input; and applying the summed input to a transfer function associated with a neuron in the trained neural network.

Natarajand teaches determining the aeroelastic characteristics comprises: multiplying received input parameters by the weight vector to generate weighted parameters (**Natarajan,** p53:9; X_i is the mass input and W_i is the weight vector.); summing the weighted parameters and the bias value to generate a summed input (**Natarajan,** p54 Figure 3.1, Input and weight go into biases 'b' and 'c'); and applying the

summed input to a transfer function associated with a neuron in the trained neural network. (**Natarajan,** p53:10 through p54:8) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Spencer and NMAB-497 by going through basic neural network algorithms as taught by Natarajan to determine the aeroelastic characteristics comprises: multiplying received input parameters by the weight vector to generate weighted parameters; summing the weighted parameters and the bias value to generate a summed input; and applying the summed input to a transfer function associated with a neuron in the trained neural network.

For the purpose of using established neural network procedures for reliable results.

Claim 23

Spencer and NMAB-497 do not teach applying the predetermined neural network transfer function comprises: multiplying the at least one input parameter with a weight vector to produce at least one weighted input parameter; summing together the at least one weighted input parameter and a bias value to generate a summed value; and applying a neuron transfer function to the summed value.

Natarajan teaches applying the predetermined neural network transfer function comprises: multiplying the at least one input parameter with a weight vector to produce at least one weighted input parameter(**Nartarajan,** p53:9; X_i is the mass input and W_i is the weight vector.); summing together the at least one weighted input parameter and a

bias value to generate a summed value (**Natarajan,** p54 Figure 3.1, Input and weight go into biases 'b' and 'c'); and applying a neuron transfer function to the summed value. (**Natarajan,** p53:10 through p54:8) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Spencer and NMAB-497 by using standard neural network techniques as taught by Natarajan by multiplying the at least one input parameter with a weight vector to produce at least one weighted input parameter; summing together the at least one weighted input parameter and a bias value to generate a summed value; and applying a neuron transfer function to the summed value.

For the purpose of demonstrating the consistence construction of this neural network with other neural networks.

Claim 29

Spencer does not teach receiving a mass input.

NMAB-497 teaches receiving a mass input. (**NMAB-497,** p41:3-14; Examples of 'mass input' of applicant is illustrated by fatigue, corrosion, foreign object impact of NMAB-497.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Spencer by having numerous inputs as taught by NMAB-497 by receiving a mass input.

For the purpose of having more than one input variable for the neural network.

Spencer teaches receiving a location of the mass on an aircraft structure (**Spencer,** p539:35-41)

Spencer and NMAB-497 do not teach applying a neuron transfer function to the summed value to generate an aeroelastic analysis flutter result and outputting the flutter result; multiplying the mass input and location with a weight vector to produce weighted input parameters; summing together weighted input parameters and a bias value to generate a summed value.

Natarajan teaches applying a neuron transfer function to the summed value to generate an aeroelastic analysis flutter result (**Natarajan,** p53-58; 'Aeroelastic analysis flutter result' of applicant is equivalent to 'applications such as flutter control' of Natarajan.)and outputting the flutter result. (**Natarajan,** p57:17-18; If there exists flutter control then there must be output for flutter results.) multiplying the mass input and location with a weight vector to produce weighted input parameters (**Natarajan,** p53:9; X_i is the mass input and W_i is the weight vector.); summing together weighted input parameters and a bias value to generate a summed value. (**Natarajan,** p53:9; The summation sign implies 'summing together'.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Spencer and NMAB-497 by generating the flutter result to get a result of a summed value as taught by Natarajan to apply a neuron transfer function to the summed value to generate an aeroelastic analysis flutter result and outputting the flutter result; multiplying the mass input and location with a weight vector to produce weighted input parameters; summing together weighted input parameters and a bias value to generate a summed value.

For the purpose of generating a final result which can be employed.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 11, 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Spencer and NMAB-497 as set forth above, in view of Kawada. (U. S. Patent 5784739, referred to as **Kawada**)

Claims 11, 24

Spencer and NMAB-497 do not teach at least one aeroelastic analysis result comprises a flutter speed at a damping value.

Kawada teaches at least one aeroelastic analysis result comprises a flutter speed at a damping value. (**Kawada,** C5:5-15) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Spencer and NMAB-497 by generating aeroelastic values by the neural

network as taught by Kawada to have at least one aeroelastic analysis result comprises a flutter speed at a damping value.

For the purpose of using the result for determining what speed flutter occurs at what damping value.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 12, 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Spencer and NMAB-497 as set forth above, in view of Schnetz. (U. S. Patent 6189830, referred to as **Schnetz**)

Claims 12, 26

Spencer and NMAB-497 do not teach at least one aeroelastic analysis result comprises a flutter frequency and a corresponding flutter speed at a damping value.

Schnelz teaches at least one aeroelastic analysis result comprises a flutter frequency and a corresponding flutter speed at a damping value. (**Schnelz,** C1:56-64; Schnelz illustrates an example of 'flutter speed', 'frequency' and 'damping'.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Spencer and NMAB-497 by outputting flutter frequency at a given flutter speed as taught by Schnelz to generate at least one aeroelastic analysis result comprises a flutter frequency and a corresponding flutter speed at a damping value.

For the purpose of determining at what speed will flutter frequency will occur in relation to damping.

Response to Arguments

5. Applicant's arguments filed on July 20, 2006 for claims 1-30 have been fully considered but are not persuasive.

6. In reference to the Applicant's argument:

The Examiner objects to the terms "scalar bias value," "bias value," "bias module," "store loading," and "maximum weight" appearing in claims 6, 13, 16, 19, and 27. The Examiner requests the Applicant amend the Specification and Drawings to describe the claimed subject matter.

Applicant amends the Specification or the claims to ensure that the terms are described in the Specification. For example, the terms "bias module," "bias value," and "scalar bias value" are described in the Specification, at page 8, paragraph [0044].

Applicant amends claim 13 to change the term "store loadings" to align with the term --store loads-- appearing in the Specification at page 14, paragraph [0074].

Applicant amends the Specification at page 11, paragraph [0057] to explicitly include the term "maximum weight." It is clear from the original Specification that the paragraph discusses a range of allowable weights and gives an example of a maximum weight.

No new matter is added with the amendments. Applicant respectfully request withdrawal of the objections in light of the amendments to the Specification and claim.

Examiner's response:

Examiner withdraws the rejection of 'bias value' and 'store loading'. The rejection for the terms 'bias module', 'scalar bias value' and 'maximum weight' stand. Applicant claims that these terms are in ¶0044 and ¶0057, but the Examiner could not find these terms anywhere in the specification. Rejection stands.

7. In reference to the Applicant's argument:

Discussion of Resections Under 35 U.S.C. §102

Claims 1, 2, 5, 14, 15, 21, 22, 28, 29, and 30 were rejected under 35 U.S.C. § 102(b) as allegedly anticipated by "Adaptive nonlinear neural network controller for rotorcraft vibration" by Spencer et al., 1997, SPIE Vol 3-041, 538-553, (hereinafter Spencer). Claims 17-20 were rejected under 35 U.S.C. §102(b) as allegedly anticipated by the PhD dissertation "Aeroelasticity of morphing wings using neural networks" to Natarajan, 2002, (hereinafter Natarajan).

In order for a claim to be anticipated by a reference, the single prior art reference must describe, either expressly or inherently, each and every element as set forth in the claim. Applicant contends that the cited references fail to describe at least on element as set forth in the claims.

Claim 1 is amended to include the feature that "the one or more input parameters relating to a repair of the structure." Support for the amendment is found throughout Applicant's Specification. See, for example, Applicant's Specification, at paragraph [0057]. Claim 1 also includes a neural network transformation that is "based in part on a trained neural network." These features are not described in Spencer.

Spencer is not even directed to aeroelastic analysis and, instead, is directed to a control system to control the vibration of rotor blades. See, Spencer, Abstract. Spencer fails to describe any aeroelastic analysis, because Spencer is directed to vibration control of a mechanical structure.

The Examiner argues that Spencer describes aeroelastic analysis of a structure and cites to Spencer, at page 539, 11. 8-18. However, the cited portion of Spencer states: "...a neural network is used in real time to adaptively approximate unknown periodic disturbance forces acting on the rotor blade due primarily to the aerodynamic forces." Spencer, at page 539, 11. 16-18. Spencer expressly states that the neural network is used as part of a control method used to control rotor blades. Id., at 11. 8-10. Spencer notes that aerodynamic forces contribute to the periodic disturbances acting on a rotor blade, but fails to describe aeroelastic analysis.

Furthermore, Spencer expressly states: "The use of neural networks in the controller presented below, however, is different because off-line training is not performed." Id., at 11. 14-15. Thus, Spencer expressly states that training is not performed.

Therefore, because Spencer fails to describe aeroelastic analysis, fails to describe a repair to a structure, and fails to describe a trained neural network, Spencer fails to describe every claimed feature in the manner set forth in claim 1.

Examiner's response:

Applicant states that a control method is not aeroelastic analysis. Examiner disagrees, in order to control the rotor it first must be analyzed to determine how to control it. Training is done in real time thus training is performed. Examiner brought in NMAB-497 for the amended claims which have to do with analysis and repair of an aircraft using neural networks.

8. In reference to the Applicant's argument:

Claim 14 includes: "a neural network module coupled to the input module and configured to provide the weight and location as inputs to a trained neural network having at least two neurons to determine a flutter speed and an associated flutter frequency based in part on the weight and location." Spencer fails to describe at least this claimed feature.

Spencer fails to describe a neural network having at least two neurons, and fails to describe providing a weight and location to such a neural network. The Examiner fails to identify any portion of Spencer describing the claimed feature.

Additionally, Spencer fails to describe flutter a speed and associated flutter frequency. The Examiner contends that the rotational speed described in Spencer corresponds to the claimed flutter speed. However, careful examination of Spencer reveals that this cannot be the case. Spencer describes a rotational speed, but states: "The rotation of the hub is assumed to be at a constant speed, Sl ." Spencer, at page 539, last paragraph. Thus, the analysis performed in Spencer clearly does not determine a rotational speed because the rotational speed is assumed to be constant.

Furthermore, the Examiner fails to provide any explanation as to how the rotational speed is related to a flutter speed, which Applicant describes in the Specification in association with Figure 3. The flutter speed is a characteristic of the structure being analyzed, while the rotational speed described in Spencer is the speed at which the rotor blades are subjected. Spencer does not equate the two and fails to include any description of flutter speed.

Therefore, claim 14 is believed to be allowable over Spencer, because Spencer fails to describe every claimed feature.

Examiner's response:

Applicant claims that Spencer fails to describe a neural network having two neurons. A neural network with only one neuron is a neuron and not a neural network. Spencer illustrates flutter speed and flutter frequency in p538:14 through p539:28, p545:13-24; 'Flutter speed' and 'flutter frequency' of applicant is equivalent to 'rotational speed (Ω)' and dominant frequency ($N\Omega$). Per claim 14 the neural network determines a flutter speed and an associated flutter frequency. This means the frequency is

dependent on the speed. It does not matter if the speed is constant or not. Spencer determines the frequency based on speed.

9. In reference to the Applicant's argument:

Claim 17 includes a feature of "determining input parameters relating to one or more repairs performed on a structure." Similarly, claim 21 includes "receiving at least one input parameter related to a repair of an aircraft structure," claim 28 includes "receiving at least one input parameter related to a repair of an aircraft structure," claim 29 includes "receiving a mass input related to a repair," and claim 30 includes "means for receiving input parameters relating to a repair of an aircraft structure."

Spencer fails to describe these features as discussed above in relation to claim 1. Additionally, Natarajan fails to describe any repairs on aircraft structures or the use of a neural network to perform aeroelastic analysis of a repaired structure. Therefore, claims 17, 21, 28, and 30 are believed to be allowable at least for the reason that the references fail to describe every claimed feature.

Applicant respectfully request reconsideration, withdrawal of the rejections to claims 1, 14, 17, 21, 28, and 30.

Discussion of Resections Under 35 U.S.C. X103

Examiner's response:

NMAB-497 addresses using neural networks for repair and analysis methods on a structure. NMAB-497 also address the structure is an aircraft.

10. In reference to the Applicant's argument:

Claims 3-4 were rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over Spencer in view of U.S. Patent Publication No. 20030191406 to Eberhart et al.

(hereinafter Eberhart). Claims 6-10, 13, 16, 23, 25, 27, and 29 were rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Spencer in view of Natarajan. Claims 11 and 24 were rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Spencer in view of U.S. Patent No. 5,784,739 to Kawada et al. (hereinafter Kawada). Claims 12 and 26 were rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Spencer in view of U.S. Patent No. 6,189,830 to Schnelz et al. (hereinafter Schnelz).

To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be reasonable expectation of success. Finally, the prior art reference, or references when combined, must teach or suggest all of the claim limitations.

The cited references, whether alone or in combination, fail to teach or suggest every claimed feature. Moreover, there is no motivation to combine or modify the reference teachings in a manner that would lead one of ordinary skill in the art to the claimed invention.

Examiner's response:

Claims 3, 4 of applicant introduce common computer hardware items needed to implement a neural network. Most of these items are found in every home computer and are not uncommon at all. Eberhart lists these common computer items to fulfill the stated claims and using these items to operate a computer is obvious.

11. In reference to the Applicant's argument:

As described above, claim 29 includes "receiving a mass input related to a repair." Neither Spencer nor Natarajan teaches or suggests the claimed feature. The combination of the two references does not teach or suggest the features absent from each reference individually. Therefore, claim 29 is believed to be allowable over Spencer in view of Natarajan, because the combination of references fail to teach or suggest every claimed feature.

Furthermore, there is not motivation to combine the references in the manner suggested by the Examiner. The prior art must suggest the desirability of the claimed invention. See, generally, MPEP 2143.01. The teaching or suggestion to suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in Applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. In re Mills, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). It is error to reconstruct the claimed invention from the prior art by using the claim as a "blueprint." When prior art references require selective combination to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight obtained from the invention itself. Interconnect Planning Corp. v. Feil, 774 F.2d 1132, 227 USPQ 543 (Fed. Cir. 1985).

The prior art fails to provide any reason for combination, and the Examiner fails to provide any motivation to combine that has the level of specificity needed to make the selective combination argued by the Examiner.

For example, Spencer is directed to a neural network for controlling rotorcraft vibration and Natarajan is directed to aeroelasticity of morphing wings. The Examiner provides only general motivations to combine, such as "For the purpose of highlighting the basic components of a neural network." or "For the purpose of taking advantage of a neural network property of handling non-linear problems with exceptional results." See, Office Action, at page 11. However, the Examiner fails to relate how the general motivations argued motivate one to make the very specific modifications argued.

There is nothing in the general motivations argued by the Examiner that would motivate one of ordinary skill in the art to combine a rotorcraft controller with the teachings of a PhD dissertation in aeroelasticity of morphing wings. Moreover, the Examiner does not argue a combination of the general principles, but rather, a specific combination of elements extracted from the Nataraj an reference for use in the Spencer reference. The argued motivations provide no support for the selective combination.

Additionally, there is no motivation to combine the teachings or Kawada, Eberhart, or Schnelz with either Spencer or Nataraj an. Schnelz is directed to a engine mount for a jet aircraft. The Examiner fails to provide any plausible motivation that would lead one interested in aeroelastic analysis using neural networks to look at a reference directed to an aircraft engine mount.

Eberhart is directed to a method of diagnosing neurological disorders. The Examiner fails to provide any plausible motivation that links neurological disorders to aeroelastic analysis using neural networks. Similarly, Kawada is directed to a super-long suspension bridge, and the Examiner fails to provide any plausible motivation that links neurological disorders to aeroelastic analysis using neural networks. For each of the

combinations, the Examiner sets forth a very general motivation but fails to describe how the general motivation leads one to the specific modification or combination argued in the rejection.

Applicant respectfully requests reconsideration and withdrawal of all rejections under 35 U.S.C. §103(a) because the Examiner fails to provide any plausible motivation to combine the reference teachings in the specific manner argued in the rejections.

Discussion of Dependent Claims

Claims 2-13, 15-16, 18-20, and 22-27 depend from one of claims 1, 14, 17, or 21 and are believed to be allowable at least for the reason that they depend from an allowable base claim. Applicant respectfully requests reconsideration and allowance of claims 2-13, 15-16, 18-20, and 22-27.

Each of the dependent claims may have individual bases for patentability beyond those discussed above in relation to the independent claims. It is not necessary to discuss the patentable distinctions of each dependent claim because of the allowability of the base claims from which they depend.

However, as noted above, there is no motivation to combine any of the references together in a manner that would lead one of ordinary skill in the art to the claimed invention. Thus, the lack of any motivation to combine the cited references is an independent reason for allowance of many of the dependent claims.

Examiner's response:

"Receiving a mass input related to a repair" of applicant is not described in the specification thus the Examiner read this as more than one input parameter. NMAB-497 illustrates more than one input parameter. Applicant claims there is no motivation to combine NMAB-497 with Spencer and Natarajan. All three references use neural networks to analyze aircraft components with results depending on their design. Spencer is for controlling vibration, Natarajan is for morphing wings and NMAB-497 has to do with analyzing aging aircraft. Since all three have to due with aircraft components which are directly used for flight, these fall within the applicants definition of aeroelastic

analysis. In response to Applicant's argument that there is no suggestion to combine the references, the Examiner recognizes that references cannot be arbitrarily combined and that there must be some reason why one skilled in the art would be motivated to make the proposed combination of references. In re Nomiya, 184 USPQ 607 (CCPA 1975). However, there is no requirement that a motivation to make the modification be expressly articulated. The test for combining references is not what individual references themselves suggest but rather what the combination of disclosures taken as a whole would suggest to one of ordinary skill in the art. In re Keller, 648 F.2d 413, 208 USPQ 871 (CCPA 1981); In re Sernaker, 702 F.2d 989, 217 USPQ 1 (Fed. Cir. 1983); In re McLaughlin, 170 USPQ 209 (CCPA 1971). References are evaluated by what they suggest to one versed in the art, rather than by their specific disclosures. In re Bozek, 163 USPQ 545 (CCPA 1969).

Examination Considerations

12. The claims and only the claims form the metes and bounds of the invention. "Office personnel are to give the claims their broadest reasonable interpretation in light of the supporting disclosure. *In re Morris*, 127 F.3d 1048, 1054-55, 44USPQ2d 1023, 1027-28 (Fed. Cir. 1997). Limitations appearing in the specification but not recited in the claim are not read into the claim. *In re Prater*, 415 F.2d, 1393, 1404-05, 162 USPQ 541, 550-551 (CCPA 1969)" (MPEP p 2100-8, c 2, l 45-48; p 2100-9, c 1, l 1-4). The Examiner has the full latitude to interpret each claim in the broadest reasonable sense.

Examiner will reference prior art using terminology familiar to one of ordinary skill in the art. Such an approach is broad in concept and can be either explicit or implicit in meaning.

13. Examiner's Notes are provided to assist the applicant to better understand the nature of the prior art, application of such prior art and, as appropriate, to further indicate other prior art that maybe applied in other office actions. Such comments are entirely consistent with the intent and sprit of compact prosecution. However, and unless otherwise stated, the Examiner's Notes are not prior art but link to prior art that one of ordinary skill in the art would find inherently appropriate.

14. Examiner's Opinion: Paragraphs 12 and 13 apply. The Examiner has full latitude to interpret each claim in the broadest reasonable sense.

Conclusion

15. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

16. Claims 1-30 are rejected.

Correspondence Information

17. Any inquiry concerning this information or related to the subject disclosure should be directed to the Examiner Peter Coughlan, whose telephone number is (571) 272-5990. The Examiner can be reached on Monday through Friday from 7:15 a.m. to 3:45 p.m.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor David Vincent can be reached at (571) 272-3687. Any response to this office action should be mailed to:

Commissioner of Patents and Trademarks,

Washington, D. C. 20231;

Hand delivered to:

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Customer Service Window,

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401 Dulany Street,

Alexandria, Virginia 22313,

(located on the first floor of the south side of the Randolph Building);

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(571) 273-8300 (for formal communications intended for entry.)

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Peter Coughlan

9/27/2006

9/29/06

DAVID VINCENT
SUPERVISORY PATENT EXAMINER